Eastern white pine secondary manufacturers: Consumption, markets, and marketing

Delton Alderman*
Robert Smith*
Scott Bowe*

Abstract

In the United States, eastern white pine (EWP) is used in the manufacture of interior planks, clapboards, furniture, doors and windows, decorative veneers, and moulding/millwork. Additional value-added markets for EWP raw material include toys, woodenware, novelties, signs, caskets, and products used in building construction (EWP furring was formerly a leading construction wood), shade and map rollers, and Venetian blinds. Our research question focused on regional differences in EWP manufacture and consumption as well as EWP quality attributes, substitutes, markets and competition, and management. To assess EWP secondary manufacturing, a mail survey was conducted in the New England, Mid-Atlantic, and Lake States regions of the United States. The majority of respondents reported annual sales of less than $1 million, employed fewer than 25 people, operated a single facility, and procured EWP primarily from within their region. The effect of imported species was surprisingly less than anticipated, with more than half of the respondents reporting that imports did not have an effect on their business. Superior lumber quality and region-of-origin were reported by secondary manufacturers as having the greatest influence on purchasing decisions. *Having a good reputation*, *consistent pricing*, and *on-time delivery* were the business services most highly valued by secondary EWP manufacturers.

When the first European settlers arrived stands of eastern white pine (EWP) (*Pinus strobus* L.) contained an estimated 600 billion board feet (BBF) of lumber (Wendel and Smith 1990). EWP lumber was first exported to England in 1605, as the forests of Maine and then all of New England, supplied EWP timber demand for more than 200 years (Nelson 1973). By 1840, the New England states no longer met the growing demand for EWP products (Schatzel 2004), and the western migration of EWP harvesting began in earnest. Minnesota's EWP stands were being harvested by the late 1830s (Paulson 1999) and by the mid1850s, EWP was the most desired lumber species in the Great Lakes region (Schatzel 2004). Most of the great EWP stands were logged by the early 1900s (Wendel and Smith 1990).

In the 20th century, the box and shook market was predominant as round-edged, air-dried lumber was preferred. Today, EWP is primarily a planed-board, kiln-dried market in New England (Smith 2003). Elsewhere in the United States, EWP is used in the manufacture of interior planks, clapboards, furniture, doors and windows, decorative veneers, and moulding/millwork. Additional markets for EWP raw material include toys, woodenware, novelties, signs, caskets, shade and map rollers, Venetian blinds, and products used in building construction—EWP furring was formerly a leading construction species.

Problem statement and objectives

Our research question focused on regional differences in EWP secondary manufacture (i.e., primary products, mar-

The authors are, respectively, Research Scientist, USDA Forest Serv., Northern Research Sta., Princeton, West Virginia (dalderman@fs.fed.us); Professor, Dept. of Wood Sci. and Forest Products, Virginia Tech, Blacksburg, Virginia (rsmith4@vt.edu); and Associate Professor, Dept. of Forest Ecology and Management, Univ. of Wisconsin-Madison, Madison, Wisconsin, (sbowe@wisc.edu). Financial support for this project was received from the Northern Research Sta.'s Forestry Sciences Lab., Princeton, West Virginia. The authors thank Jeff Easterling and the Northeastern Lumber Manufacturers' Assoc. for their support with this project, and Paul Duval, former graduate student, for conducting the primary research. This paper was received for publication in May 2006. Article No. 10195.
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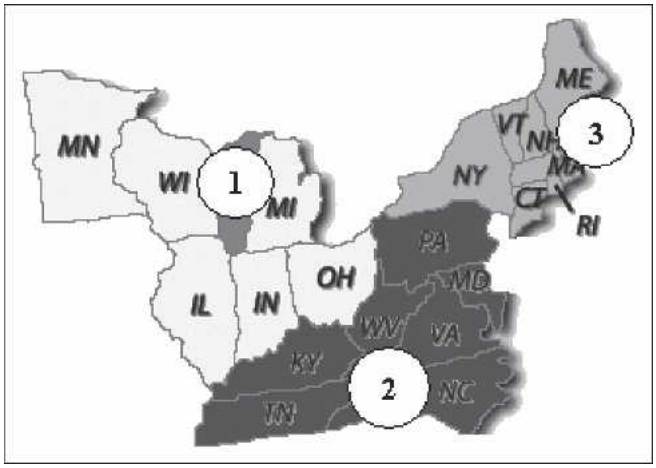

Figure 1. — Regional map and study regions: 1) Lake States, 2) Mid-Atlantic, 3) New England.

kets) and the consumption/utilization of EWP. In addition, we attempted to identify differences in market characteristics among the three regions producing EWP—New England, Mid-Atlantic, and Lake States (**Fig. 1**). We also investigated EWP secondary manufacturing, quality attributes, substitute products, competition, and management strategies to detect potential differences in those areas. A primary goal of this research is to provide market information for EWP producers and manufacturers with knowledge that will assist them in production and marketing.

Objectives

1. To identify regional eastern white pine market characteristics by secondary manufacturers, which included: EWP quality attributes/requirements, sales, and business attributes.
2. To assess eastern white pine marketing and strategic management strategies.
3. To assess the impact of imported species on EWP markets.

Methodology

Market and utilization data were collected from EWP secondary manufacturers via a mail questionnaire survey. The 8-page questionnaire was reviewed by U.S. Forest Service personnel and faculty from the University of Wisconsin and Virginia Polytechnic Institute and State University; then the instrument was pretested among the industry; 51 responses were received. EWP industry manufacturing types included: barrel, cabinetry, caskets, crafts, moulding and millwork, siding, signs, etc. and by a representative of an industry association. The questionnaire consisted of 24-questions (categorical, scale, and open-ended). The population of interest was secondary EWP producers in three U.S. regions: New England (NE) (Connecticut, Massachusetts, Maine, New Hampshire, New York, Rhode Island, Vermont); Mid-Atlantic (MA) (Kentucky, Maryland, North Carolina, Pennsylvania, Tennessee, West Virginia, Virginia); and Lake States (LS) (Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin). The sample frame for each region was developed on a state-by-state basis. State authorities who track the forest products industry were contacted, and copies of industry directories were obtained, as was the membership directory of the Northeastern Lumber Manufacturers' Association (NeLMA). NeLMA is the primary industry association for EWP producers, and its membership is representative of the EWP industry.

To ensure sufficient sample sizes, an equation for developing statistically significant sample sizes was applied (Ballenger and McCune, 1990). The equation is based on the premise that sample size should be derived from the question introducing the most variation into the survey. The equation and calculations are as follows:

$$n = [(Z_{\alpha/2})^2(\sigma)^2]/h^2$$

Where:

n = sample size

$Z_{\alpha/2}$ = reliability coefficient

σ = estimated population SD

h = allowable tolerance level

Using a 95 percent confidence level, the calculations are as follows:

$$Z_{\alpha/2} = 1.96$$

$$\sigma = (\text{max value} - \text{min value})/6 = (7 \text{ to } 1)/6 = 1$$

$$h = \pm 0.2 \quad \text{for} \quad \alpha = 0.05$$

$$n = [(1.96)^2(1)^2]/(0.2)^2 = 96.04 \text{ rounded to } 97$$

Therefore, a sample of roughly 100 respondents was desired from each group being compared. Using a conservative response rate estimate of 20 percent, it was determined that 500 questionnaires were to be sent to secondary manufacturers in each region, assuming a sufficient supply of addresses. After development of the sample frame and pretesting, the initial mailing, consisting of a personalized cover letter and questionnaire, was mailed to 1,449 secondary manufacturers in April 2004. The first mailing was followed by a reminder postcard about 3 weeks later, a second questionnaire was mailed 2 weeks after the reminder postcard, and a second reminder postcard was mailed after an additional 3 weeks.

The questionnaire requested information on several aspects of EWP secondary manufacturing, which included: demographic (i.e., job title, number of employees, facilities, etc.); EWP market characteristics (i.e., production, sales in dollars, production mix, and markets); EWP regional quality comparisons to ascertain the perceptions of quality among the three regions and grading rules employed; EWP log availability; EWP raw material procured from within and from other regions (and why); the effect of imported species on operations; EWP product and business attributes; marketing and promotional efforts; and technology investment and frequency. Likert-type questions, with a range of 1 to 7, were utilized to maximize variance among the respondents.

Several statistical techniques were employed for data analysis: Student's and independent samples *t*-tests, principal components analysis (PCA) (varimax rotation), and analysis of variance (ANOVA) *F*-tests, multivariate ANOVA *F*-tests, and nonparametric ANOVA (both $\alpha = 0.05$). All techniques employed a statistical level or *p*-values (*p*) of 0.05, and SPSS® 12.0 was used for all analysis. PCA was used for data reduction in order to simplify the data set (i.e., reducing the information from several measured variables into a smaller set to maximize variance) and to detect structure in the relationships

Table 1. — Annual sales and number of employees by region.

	Mill tally by region							
Total sales	NE	MA	LS	Employees	NE	MA	LS	
($)								(%)
< 1 mil	30	16	12	< 25	30	16	12	54.7
1 to 5 mil	9	12	6	25 to 50	9	12	6	25.5
5 to 15 mil	3	7	2	51 to 100	3	7	2	11.3
15 to 25 mil	0	1	1	101 to 200	0	1	1	1.9
25 to 50 mil	0	0	0	201 to 300	0	0	0	0.0
> 50 mil	0	4	2	301 to 400	0	4	2	5.7
				> 400	0	0	1	0.9

between variables. PCA reflects both the common and unique variance of variables, as the algorithm searches for a linear combination of variables so that maximum variance is extracted from the variables. PCA is the appropriate tool for this and other analysis since it allows the researcher to eliminate variables that do not maximize variance and assists in explaining the findings. Therefore, PCA was applied for data reduction and as a structure detection method.

Response

The adjusted response rate for all regions was 12.5 percent: A total 111 usable questionnaires were returned. The response by region was: 17.0 percent NE (44), 14.9 percent MA (42), and 7.2 percent LS (25). The adjusted response rate was calculated by dividing the number of returned and completed questionnaires by the total number mailed (after subtracting unusable questionnaires). Extra measures were taken to enhance the LS response as 30 individual mills were contacted by telephone with limited success.

Nonresponse bias

Nonresponse bias was assessed by two methods: 1) respondent survey data (30 subjects) contrasted with 30 nonrespondents contacted by phone (after completion of data collection), and 2) 10 questionnaire items via the Armstrong-Overton wave method (1977). Nonrespondents were asked four questions and then asked to estimate their annual EWP consumption. These questions assessed EWP product attributes and business service attributes (two each), with the highest and lowest overall ratings being selected for analysis: *Supports local industry*, *Rustic look*, *Consistent prices*, and *Flexible payment*. It was assumed that these attributes would be robust indicators of bias. ANOVA was performed and there were no significant differences for four of the five contrasts: *Rustic look*, *Consistent prices*, *Flexible payment*, and *Production volume*. There was strong evidence for statistical significance *Supports local industry* as respondents rated this factor higher than nonrespondents (mean: 5.30 vs. 4.07; *p*-value (p) ≤ 0.01). *Supports local industry* may be more relevant to smaller mills and the respondent sample was skewed toward these firms.

In the wave analysis, the first 30 subject responses received were contrasted with the last 30 subject responses received. The questions used for this analysis were the same as those employed in the first nonresponse bias assessment; there were no significant differences between early and late respondents.

Results and discussion

EWP secondary manufacturer demographics

Firm demographics were assessed via a series of questions. First, we asked participants to estimate 2003 total gross sales with categories ranging from *Less than $1 million* to *More than $50 million* (**Table 1**). Across all regions, 55 percent of the respondents earned Less than $1 million. Overall, nearly 81 percent of the respondents reported revenues of *less than $5 million* in 2003. Respondents were asked to provide their position or job title. Thirty-seven percent were presidents and owners, 14 percent were plant managers, and 5 percent were vice presidents. Nearly 75 percent of the respondents reported 25 or fewer employees, and nearly 86 percent operated a single facility (**Table 1**).

Next, we categorized secondary manufacturing into four segments representing nearly 76 percent of the responses: *Other* (e.g., carvings, fencing, signs, toys, and wood turnings), *moulding/millwork*, *log home/timber frame*, and *furniture*. About 13 percent of respondents manufacture products for the window, retail, and cabinet markets. Dimension, crate/container, and door manufacturers accounted for only 10 percent of the respondents. The number of moulding/millwork respondents was similar across all regions, while the majority of log home/timber frame participants were from the MA region. It should be noted that the log home/timber frame industry is not completely secondary in nature as it often uses whole logs that are not sawn but processed into round or curvilinear dimensions. For this research, the log home/timber frame market was classified as a secondary industry to distinguish it from primary manufacturing sawmills. The majority of furniture responses were from the NE region.

Finally, we asked respondents to estimate their annual EWP consumption. The mean per mill (for all regions) was nearly 622,000 BF and the median was 33,000 BF. For the NE region, the mean was slightly more than 292,000 BF and the median was 1,000 BF. In the LS, the mean was 285,600 BF and the median was 32,600 BF. For the MA region, the mean was slightly more than 1,100,000 BF and the median was 50,000 BF.

Regional EWP procurement and quality comparisons

The underutilization of EWP is a concern voiced within the industry and by regional white pine grower cooperatives. As a case in point, data on EWP growth and removal were aggregated for the states surveyed. The results indicated that growth

Table 2. — Factors for interstate EWP lumber procurement.

	NE	MA	LS	Total and (%)
Consistent supply	2	7	2	11 (23.9)
Better quality	1	6	2	9 (19.6)
Other[a]	1	5	3	9 (19.6)
Lower prices	1	4	2	7 (15.2)
Better selection	0	4	1	5 (10.9)
Ease of buying	0	3	0	3 (6.4)
Mill located on border	0	1	0	1 (2.2)
Larger log diameters	0	1	0	1 (2.2)

[a]Intraregional EWP availability.

exceeds harvest by a factor of 2.65 times (Miles 2004). Another aspect of species utilization is interregional trade. To address this issue, we asked respondents to estimate the quantity of EWP lumber procured from outside their respective region. Analysis indicates that NE secondary manufacturers procure raw material almost exclusively from within NE, though interregional trade of sawn EWP occurs among the regions. Respondents from the MA region procured 26 percent of sawn EWP from NE and nearly 7 percent from the LS. It appears that the majority of interregional trade occurs in MA region. LS participants purchased about 11 percent of sawn EWP from NE and 5 percent from MA. This finding may be an indicator of a regional EWP preference; NE EWP may be desired by MA region and LS producers with respect to EWP originating from their respective regions.

To further assess interregional trade, participants were queried as to why EWP lumber and roundwood products were purchased from outside their respective regions. Consistent supply (23.1%) was the reason cited most frequently for procuring EWP from other regions. This was followed by quality concerns and other (EWP product availability within a region), about 19 percent each (**Table 2**). Arguably, consistent supply (which can be affected by international trade, primary mill closures, etc.) and other, that is, EWP availability (weather, log availability for primary producers, and season) are correlated and at some level can be considered as a proxy for each other. Thus, supply chain issues are valid factors for firms that procure lumber from suppliers in other regions. Most responses to a qualitative question indicated that being in proximity to a discrete region did not affect procurement decisions. Rather such decisions were based on material quality. This suggests a regional preference for EWP, in this case, for EWP from NE.

We next asked respondents to rate EWP lumber quality originating from the respective regions. NE-produced EWP lumber had the highest average rating, 5.29, on a scale of 1 to 7 vs. 4.60 and 4.53 for LS and MA regions, respectively. EWP secondary manufacturers in the MA region perceive the quality of EWP in that region as better than that from LS (p = 0.05). Each region appeared to favor local EWP for quality (**Table 3**).

Next, respondents were asked to rate several EWP lumber quality attributes originating from NE, Massachusetts, or LS. *Attractive color* and *fewer defects* were rated as the first and second most important quality attributes across all three regions and secondary manufacturing segments. *Dimensional stability* and *ease of manufacturing* were other highly rated

Table 3. — Ratings of EWP lumber quality by region.

			Regional mean ratings[a]			
Region	No.	Mean	NE	MA	LS	*p-value*
NE	68	5.29	5.52	5.13	5.07	0.44
MA	57	4.53	4.25	4.82[b]	4.00[b]	0.05
LS	47	4.60	4.33	4.31	4.91	0.35

[a]Scale = 1 to 7; qualifiers = low-medium-high.
[b]Significant differences between regions.

Table 4. — EWP lumber attribute ratings by region.

			Regional mean ratings[a]			
Attribute	N	Mean	NE	MA	LS	*p-value*
Attractive color	77	4.96	5.12	4.71	5.14	0.63
Fewer defects	80	4.70	5.22	4.41	4.48	0.25
Dimensional stability	78	4.68	4.78	4.50	4.81	0.81
Easier to machine	77	4.53	5.08[b]	4.42	4.05[b]	0.03[b]
Easy to Paint	76	4.14	4.60	3.97	3.85	0.37
Aged/historical look	79	4.13	4.71	3.37	4.43	0.06
Durability	77	4.09	4.23	3.87	4.25	0.72
Strength	79	3.89	4.15	3.69	3.86	0.62
Rustic look	79	3.86	3.44	3.94	4.29	0.48

[a]Scale = 1 to 7; qualifiers = low-medium-high.
[b]Significant differences between regions.

attributes. *Easier to machine* was the only statistically significant attribute discerned. This finding has marketing implications for EWP of NE origin as it is perceived to have preferable machinability qualities (**Table 4**). EWP products with few defects were rated higher by the furniture industry segment. Clearly, marketing higher quality grades of EWP is of prime importance to this segment. Based on raw means, *color* appears to be more important in the moulding/millwork and furniture segments. As a result, *color* sorts may be a comparative advantage. While *attractive color* was rated first overall, when we aggregated the four largest market segments (moulding/millwork, furniture, log home/timber frame, and other), *fewer or minimal defects* were rated more highly (**Table 5**). Participants were asked if *local industry support* was achieved by purchasing locally produced EWP. This attribute was rated highly in regional and market segments but was not statistically significant.

The NE region was cited most frequently as producing preeminent quality EWP. States most mentioned frequently were Maine (22), New York (10), Vermont (10), New Hampshire (8), and Michigan (6).

Effect of import species

One explanation for EWP underutilization is substitution pressure from import species. During the past 15 years, species such as radiata pine (*P. radiata* D. Don) and Scots pine (*P. sylvestris* L.) have entered the U.S. marketplace in relevant volumes, disrupting traditional value chains (Horgan and Maplesden 1997, Harding et al. 1999). One research objective was to assess the impact of imported species on EWP markets and to evaluate characteristics that the secondary industry perceives as important.

First, we elicited judgments on whether import species had a positive, negative, or no effect on firm operations, and we

Table 5. — EWP lumber attribute ratings by market segment.

Attribute	N	Mean	Market segment mean ratings[a]				*p*-value
			Moulding millwork	Furniture	*Log home* Timber frame	Other[b]	
Fewer defects	53	5.25	5.06	6.08	5.17	4.00	0.09
Color	51	5.16	5.53	5.45	4.94	4.17	0.36
Dimensional stability	54	5.07	5.00	5.62	5.00	4.33	0.47
Machinability	51	4.86	4.94	5.45	4.65	4.00	0.45
Product range	51	4.69	4.94	4.64	4.67	4.00	0.79
Aged/historical look	55	4.62	4.78	5.08	4.22	4.33	0.72
Durability	51	4.49	4.53	4.64	4.47	4.17	0.97
Easy to paint	51	4.33	4.89	4.83	3.71	3.00	0.10
Strength	53	4.17	3.88	4.77	4.22	3.40	0.33
Rustic look	55	4.04	4.29	4.07	4.00	3.33	0.86

[a]Scale = 1 to 7; qualifiers = low-medium-high.
[b]Othe*r* = Carvings, fencing, signs, toys, wood turnings, etc.

then asked participants to explain their reasoning. Results indicated that imports did not have an effect on operations even though twice the number of respondents reported negative than positive effects in all regions and most industry segments (**Table 6**). This was surprising as secondary processors should benefit from price competition arising from cheaper imports, particularly in the moulding and millwork segment. Of note were several participants reporting that they had "never heard of radiata pine."

With respect to imports, most open-ended responses were negative in nature. The most frequent response cited the negative consequences associated with EWP price erosion, which was perceived as a harbinger of overall EWP industry decline (i.e., the shuttering of local manufacturing operations, both primary and secondary). This response is interesting as it implies that secondary producers perceive their businesses as being directly linked to the EWP primary industry and that reduced-cost, imported raw materials are not necessarily beneficial.

Respondents were asked a series of questions concerning the physical and business-related attributes of radiata pine that might result in competitive advantage(s). Analysis indicated that the price of radiata pine was of prime importance. The cost of raw materials was a research assumption, that is, material cost would be a driving factor for the purchase of radiata pine. At a cursory level, EWP cannot compete with radiata pine and other imports unless price reductions are realized throughout the value chain. This ultimately would have dire consequences for EWP timberlandowners. This finding suggests the need for in-depth marketing research, that is, an analysis of substitute price points that discern where EWP prices are equivalent to or lower than those of radiata pine and its substitutes. *Having fewer defects* and *strength* also were radiata pine attributes rated favorably by respondents. Both of these attributes can be countered effectively by offering EWP product lines with no or limited defects (NeLMA D & Better, Select, and Finish grades have minimal defects). Although *strength* was rated favorably, EWP typically is used in products with aesthetic appeal so material strength should not be a determining factor. In regional comparisons, both *delivery* and *ease of ordering* were statistically significant. There was mild evidence of significance for *fewer defects* and *easier to machine* in the regional analysis (**Table 7**). This implies that EWP primary producers may be able to compete more effectively by improving delivery and ordering processes and by sorting EWP to provide a better quality product.

Eastern white pine marketing and strategic management

To assess EWP marketing and management philosophies, we queried participants on marketing communication tactics, promotional activities that influenced their decision to purchase EWP from primary producers. An open-ended section was provided to list promotional activities not anticipated by the researchers.

Results indicated that EWP producers who emphasized lumber quality influenced the purchase decision of more respondents than any other marketing communication tactic (**Table 8**). This was followed by an emphasis on a discrete regions EWP quality, customer service, personal contact, other advertising, and word-of-mouth communication. Media advertising of all types was the least reported marketing communications tactic. Nonparametric ANOVA was used to assess statistical significance among marketing communication efforts and there were no statistical differences among the main effects.

We then investigated secondary manufacturer business service attributes to assess how participants valued services offered by suppliers; "Region," "Sales," "Production volume," and "Actively search for new markets" were produced by PCA analysis. We then used multivariate ANOVA and regression to determine statistical significance among fixed effects and interactions (in a statistical model the effect of two, or more, variables is not simply additive). Estimation of a model that fails to account for the interaction will not provide an accurate estimation of the true relationship between the dependent and independent variables among the main effects. Interactions yield information, for example, information that allows the researcher to interpret data and direct research. According to Friedrich (1982), this is a "low-risk strategy," if the product term is significant then a researcher keeps it in the model, otherwise the product term can be eliminated from the model.

The quantity of EWP consumed (production) was significant for the following attributes: *understanding customer needs* ($p = 0.05$), *maintaining strong business relationships* ($p = 0.02$), *competitive pricing* ($p = 0.04$), and *offering a broad product range* ($p = 0.05$). *Having a knowledgeable sales force* yielded $p = 0.00$. Further assessment of the attributes associated with production revealed that large producers (>15 MMBF) in all regions drove the findings and that respondents might emphasize customer relationship management (*pricing, product range, delivering customer needs, sales force)* and Business-to Business (B2B) interactions (*maintaining strong business relationships*) to be competitive in today's marketplace. There was a Region by Production interaction for *knowledgeable sales force* ($p = 0.00$) (**Table 9**) with larger NE producers driving this interaction. These findings indicate successful business practices, that is, firms today across all

Table 6. — Effect of import species by region.

	NE		MA		LS		Total	
Effect	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)
Positive	2	5.1	4	10.5	1	4.5	7	7.1
Negative	5	12.8	9	23.7	6	27.3	20	20.2
No effect	32	82.1	25	65.8	15	68.2	72	72.7
Total	39	100	38	100	22	100	99	100

Table 7. — EWP and radiata pine lumber attribute ratings by region.

			Regional mean ratings[a]			
Attribute	No.	Mean	NE	MA	LS	p-value
Lower price	63	4.76	4.44	4.77	5.14	0.32
Fewer defects	62	4.27	3.83	4.26	4.92	0.08
Mechanical strength	62	4.18	4.11	4.10	4.46	0.50
Easier to paint	62	3.89	3.67	3.81	4.38	0.10
Fast delivery	63	3.73	3.83	3.41[b]	4.38[b]	0.01
Easier to machine	62	3.69	3.33	3.71	4.15	0.09
Ease of ordering	63	3.65	3.56	3.38[c]	4.46[c]	0.01
Dimensional stability	62	3.53	3.78	3.29	3.77	0.21

[a]Scale = 1 to 7; qualifiers = low-medium-high.
[b]Significant difference between regions.
[c]Significant difference between regions.

Table 8. — Marketing communication tactics frequencies and percentage.

Tactic	No.	(%)
Lumber quality	62	27.6
Regional quality	48	21.3
Customer service	41	18.2
Other activities[a]	18	8.0
Other advertising[b]	13	5.9
Sales force	12	5.3
NeLMA	9	4.0
Trade journals	4	1.8
Brochures	3	1.3
Firm webpage	3	1.3
Trade shows	3	1.3
Newspaper	2	0.9
Other association	2	0.9
Radio	2	0.9
Yellow pages/phone book	2	0.9
NeLMA logo	1	0.4
Firm brand/logo	0	0.0
Television	0	0.0
Total	225	100

[a]Personal contact with the sawmill and proximity to a mill.
[b]Word-of-mouth and personal contact with mill.

industries are part of a paradigm shift. Firms are focusing on customer needs to increase market share rather than relying solely on cost reductions as the only method to increase revenues.

In the analysis of region effects, *having a good reputation* ($p = 0.04$), *handling special orders* ($p = 0.01$), *understanding customer needs* ($p = 0.04$), and *maintaining strong business relationships* ($p = 0.05$) (**Table 9**) all resulted in significant statistical evidence. NE and MA participants drove these findings; the largest numbers of secondary manufacturers are in these two regions. Again, firms are placing a stronger emphasis on customer relationship management and B2B relationships as business strategies.

With respect to sales volume *having a knowledgeable sales force* was significant ($p = 0.03$). There was a significant interaction for Sales by Region for competitive prices ($p = 0.05$) and mild evidence of a significant interaction for providing *on-time delivery* ($p = 0.06$) (**Table 9**). Participants with sales volumes of at least $1 million per year drove the first finding and large firms from the MA drove the latter findings. For all three attributes, firms with large sales volumes exceeding $15 million per year apparently emphasize customer relationship management and are proactive toward entrepreneurial activities.

Twenty-five percent of the LS and NE respondents reported that they were actively seeking new markets for EWP products (8 percent NE). In this analysis, *handling special orders* and *understanding customer needs* were significant (both $p = 0.04$). There was mild evidence of significance (i.e., some evidence but not significant: $0.05 \leq p < 0.10$) for *having a good reputation* ($p = 0.06$) and *being available for the customer* ($p = 0.08$). In an analysis for Region by New Market interaction (**Table 9**), *ease of buying a product* ($p = 0.06$) produced a mild interaction (i.e., some evidence but not significant: $0.05 \leq p < 0.10$). Entrepreneurially oriented firms and ones with large sales volumes that actively sought new markets appeared to emphasize providing *special order capabilities, understanding customer needs*, and *maintaining a good reputation*. One could surmise that they also are more likely to be actively involved with their clients. Obviously, at one level this philosophy can be emulated by all firms. However, what is striking about these findings is that these attributes are considered benchmarks of entrepreneurial firms, particularly those that are not content with status quo markets.

The investment and adoption of new technology can result in a competitive advantage, directly or indirectly. Across all regions, the greatest percentage of participants (33) reported investing in new technology once every 1 to 3 years. In the LS region, 39 percent of the responding mills invest one or more times every 5 years. NE mills (24%) reported adopting new technology less than once every 10 years, and 60 percent invested once or more every 5 years. In the MA region, 43 percent invested in new technology one or more times every 5 years, and 20 percent reported such investment less than once every 10 years. Statistical significance was noted for *ease of ordering* and *fast delivery* (both $p = 0.00$). Participants that invest frequently in new technology (every 1 to 3 yr) apparently drove this finding. *Maintaining a strong business relationship* ($p = 0.02$) resulted in a region by frequency of

Table 9. — Business attributes ratings[a] with ANOVA/MANOVA results.

Attribute	No.	Mean	Regional mean ratings			p-values of demographic variables				
			NE	MA	LS	Region	Sales	Production	New markets	New technology
Good reputation	62	6.15	6.11	6.00	6.45	0.04[b]	0.58	0.31	0.06[c]	0.23
Consistent price	92	5.96	5.84	6.18	5.74	0.26	0.97	0.12	0.04[b]	0.93
On-time delivery	92	5.95	5.88	6.11	5.77	0.54	0.48	0.22	0.73	0.26
Available to customer	93	5.73	5.75	5.71	5.74	0.31	0.58	0.36	0.08[c]	0.51
Special orders	94	5.68	5.64	5.79	5.57	0.01[b]	0.99	0.29	0.15	0.30
Understand customer needs	91	5.67	5.90	5.61	5.48	0.04[b]	0.67	0.06[c]	0.04[b]	0.40
Solving customer problems	92	5.65	5.58	5.71	5.65	0.82	0.54	0.25	0.24	0.29
Maintain strong business relationship	93	5.59	5.38	5.66	5.78	0.05[b]	0.22	0.02[b]	0.20	0.14
Ease of ordering	84	5.24	5.62	5.32	4.57	0.73	0.30	0.76	0.34	0.00[b]
Fast delivery	81	5.17	5.23	5.47	4.62	0.85	0.24	0.45	0.12	0.00[b]
Knowledgeable sales force	90	5.00	4.83	5.08	5.09	0.66	0.03[b]	0.00[b]	0.88	0.06[c]
Competitive price	80	4.75	4.48	5.00	4.71	0.86	0.26	0.04[b]	0.15	0.46
JIT delivery	90	4.69	4.50	4.79	4.77	0.56	0.53	0.17	0.52	0.49
Broad product range	92	4.63	4.13	5.11	4.52	0.23	0.55	0.05[b]	0.35	0.02[b]
Flexible payments	90	3.91	3.23	4.26	4.29	0.18	0.83	0.37	0.71	0.69

[a]Scale = 1 to 7; qualifiers = low-medium-high.
[b]Evidence of statistical significance, $\alpha = 0.05$.
[c]Mild evidence of statistical significance.

technology investment interaction that appeared to be driven by MA and LS firms (**Table 9**). In today's competitive environment, those adopting new technology will become endogenous to successful firms.

A final query asked respondents to share their opinions on topics concerning EWP markets that may not have been addressed in the questionnaire. Several noted that EWP properties were good for processing and that EWP is "optimal wood for making toys." Other comments concerned the availability of EWP and the lack of air or kiln-dried EWP available on the market. Several stated that EWP grades are confusing and lack standardization across regions. Anecdotally, we know that EWP grading practices change from region to region in the eastern United States.

Summary and conclusion

The majority of respondents reported total annual sales of less than $1 million, employed fewer than 25, operated a single facility, and procured EWP primarily from within their region. EWP from NE was rated as having the highest quality though most respondents reported they had no opinion with respect to quality. Maine was the state cited most for having the highest quality EWP.

More than 70 percent of respondents stated that imports of radiata pine have had no effect on their business; however, 20 percent reported a negative effect. In a comparison of material characteristics, *attractive color* and *minimal defects* were the highest rated factors for influencing the decision to purchase radiata pine.

As marketing promotion tactics, *superior lumber quality* and *region*, had the greatest influence in purchasing decisions. *Having a good reputation*, *consistent pricing*, and *on-time delivery* were the most highly valued services for secondary EWP manufacturers.

Finally, the most successful firms apparently are those that emphasize B2B and customer relationship management. Such management philosophies may prove successful despite increasing international and substitute product pressures.

Study limitations

As with all research, limitations occur and include unanticipated factors, time, and monetary constraints. In addition, limitations include the interpretation of results and other issues that need to be considered when trying to generalize these analyses to the broader issue of interest. Despite the low response rate, efforts were made to ensure that the data were accurate. The data suggest that the respondents may have been skewed toward smaller secondary producers; however, the nonresponse bias demonstrated only one significant result suggesting that the results could apply to the larger population. We also did not ask respondents to categorize or differentiate between "green" or "air/kiln dried" lumber utilization, this may have had an impact in the responses.

This study represents a "snapshot in time" of EWP secondary manufacturers in the eastern United States. Since the response was weighted to larger mills, these results may not accurately reflect smaller EWP producers.

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